

1      CLAIMS:

2      1. A semiconductor processing method, comprising:  
3                providing a silicon nitride material having a surface, the surface  
4                comprising a nitrogen barrier region, the nitrogen barrier region  
5                comprising silicon and nitrogen;  
6                forming a photoresist over the silicon nitride material surface; and  
7                restricting diffusion of nitrogen from the silicon nitride material to  
8                the photoresist with the barrier.

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10     2. The method of claim 1 wherein the barrier comprises silicon  
11        oxynitride formed by exposing the silicon nitride material to an  
12        atmosphere comprising oxygen.

13  
14     3. The method of claim 1 wherein the barrier comprises a  
15        silicon nitride having a higher concentration of silicon than a remainder  
16        of the silicon nitride material.

1           4. A semiconductor processing method, comprising:  
2           providing a silicon nitride material having a surface;  
3           forming a photoresist over the silicon nitride material surface; and  
4           providing a barrier layer between the silicon nitride material and  
5           the photoresist, the barrier layer restricting diffusion of nitrogen from the  
6           silicon nitride material to the photoresist, and comprising silicon and  
7           nitrogen.

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9           5. The method of claim 4 wherein the barrier layer comprises  
10           a thickness of less than or equal to about 5 nanometers.

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12           6. The method of claim 4 wherein the barrier layer comprises  
13           silicon, oxygen and nitrogen.

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15           7. The method of claim 4 wherein the barrier layer comprises  
16            $Si_xN_yO_z$ , wherein x, y and z are greater than or equal to 1 and less than  
17           or equal to 5.

18

19           8. The method of claim 4 wherein the barrier layer comprises  
20           silicon oxynitride formed by exposing the silicon nitride material to an  
21           atmosphere comprising oxygen.

1           9. The method of claim 8 wherein the oxygen is in the form  
2 of one or more of ozone, NO or N<sub>2</sub>O.

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4           10. The method of claim 4 wherein the barrier layer comprises  
5 silicon oxynitride formed by plasma-enhanced chemical vapor deposition.

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7           11. The method of claim 4 wherein the barrier layer comprises  
8 silicon oxynitride formed by rapid thermal processing.

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10          12. The method of claim 4 wherein the barrier layer comprises  
11 silicon oxynitride formed by high pressure oxidation.

12

13          13. The method of claim 4 wherein the barrier layer comprises  
14 silicon oxynitride formed by low pressure oxidation.

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16          14. The method of claim 4 wherein the barrier layer comprises  
17 a silicon nitride layer having a higher stoichiometric amount of silicon  
18 than the silicon nitride material.

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20          15. The method of claim 4 wherein the barrier layer comprises  
21 Si<sub>x</sub>N<sub>y</sub>, wherein x is greater than or equal to y.

1           16. The method of claim 4 wherein the barrier layer comprises  
2           a silicon nitride layer having a higher stoichiometric amount of silicon  
3           than the silicon nitride material and is formed by chemical vapor  
4           deposition in a common and uninterrupted deposition process with the  
5           silicon nitride material.

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7           17. A semiconductor processing method, comprising:  
8           providing a silicon nitride material having a surface;  
9           forming a barrier layer over the surface of the material, the barrier  
10          layer comprising silicon and nitrogen;  
11          forming a photoresist over and against the barrier layer;  
12          exposing the photoresist to a patterned beam of light to render at  
13          least one portion of the photoresist more soluble in a solvent than an  
14          other portion, the barrier layer being an antireflective surface that  
15          absorbs light passing through the photoresist; and  
16          exposing the photoresist to the solvent to remove the at least one  
17          portion while leaving the other portion over the barrier layer.

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19           18. The method of claim 17 wherein the barrier layer comprises  
20          a silicon nitride layer having a higher stoichiometric amount of silicon  
21          than the silicon nitride material.

1           19. The method of claim 17 wherein the barrier layer comprises  
2            $\text{Si}_x\text{N}_y$ , wherein x is greater than or equal to y.

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4           20. The method of claim 17 wherein the silicon nitride material  
5           comprises  $\text{Si}_3\text{N}_4$ , and wherein the barrier layer comprises  $\text{Si}_x\text{N}_y$ , wherein  
6           x is greater than or equal to y.

7  
8           21. The method of claim 17 wherein the barrier layer comprises  
9           a silicon nitride layer having a higher stoichiometric amount of silicon  
10          than the silicon nitride material and is formed by chemical vapor  
11          deposition in a common and uninterrupted deposition process with the  
12          silicon nitride material.

13  
14          22. A semiconductor wafer assembly, comprising:  
15            a silicon nitride material having a surface;  
16            a barrier layer over the surface of the material, the barrier layer  
17          comprising silicon and nitrogen; and  
18            a photoresist over and against the barrier layer.

19  
20          23. The semiconductor wafer assembly of claim 22 wherein the  
21          barrier layer comprises a thickness of less than or equal to about 5  
22          nanometers.

1           24. The semiconductor wafer assembly of claim 22 wherein the  
2           barrier layer comprises silicon, oxygen and nitrogen.

3  
4           25. The semiconductor wafer assembly of claim 22 wherein the  
5           barrier layer comprises silicon oxynitride.

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7           26. The semiconductor wafer assembly of claim 22 wherein the  
8           barrier layer comprises a silicon nitride layer having a higher  
9           stoichiometric amount of silicon than the silicon nitride material.

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11          27. The semiconductor wafer assembly of claim 22 wherein the  
12          barrier layer comprises  $\text{Si}_x\text{N}_y$ , wherein x is greater than or equal to y.

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14          28. A semiconductor wafer assembly, comprising:  
15            a silicon nitride material having a surface and comprising a  
16            nitrogen diffusion barrier at the surface, the barrier comprising silicon  
17            and nitrogen; and  
18            a photoresist over and against the barrier.

19  
20          29. The semiconductor wafer assembly of claim 28 wherein the  
21          barrier layer comprises a thickness of less than or equal to about 5  
22          nanometers.

1           30. The semiconductor wafer assembly of claim 28 wherein the  
2           barrier comprises silicon, oxygen and nitrogen.

3  
4           31. The semiconductor wafer assembly of claim 28 wherein the  
5           barrier comprises silicon oxynitride.

6  
7           32. The semiconductor wafer assembly of claim 28 wherein the  
8           barrier comprises  $\text{Si}_x\text{N}_y$  and a remainder of the silicon nitride material  
9           comprises  $\text{Si}_s\text{N}_t$ , a ratio of x to y being greater than a ratio of s to t.

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11          33. The semiconductor wafer assembly of claim 28 wherein the  
12          barrier comprises a greater concentration of silicon than a remainder of  
13          the silicon nitride material.